Interreg Baltic Sea Region

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EUROPEAN REGIONAL DEVELOPMENT FUND

daimon
Decision Aid for Marine Munitions
PRACTICAL APPLICATION

EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

Decision Aid for Munition Management

Practical Application

Jacek Bełdowski, IOPAN

Situation of Baltic Sea dumped munitions

CHEMSEA
CHEMICAL MUNITIONS SEARCH & ASSESSMENT

MODUM
TOWARDS THE MONITORING OF DUMPED MUNITIONS THREAT

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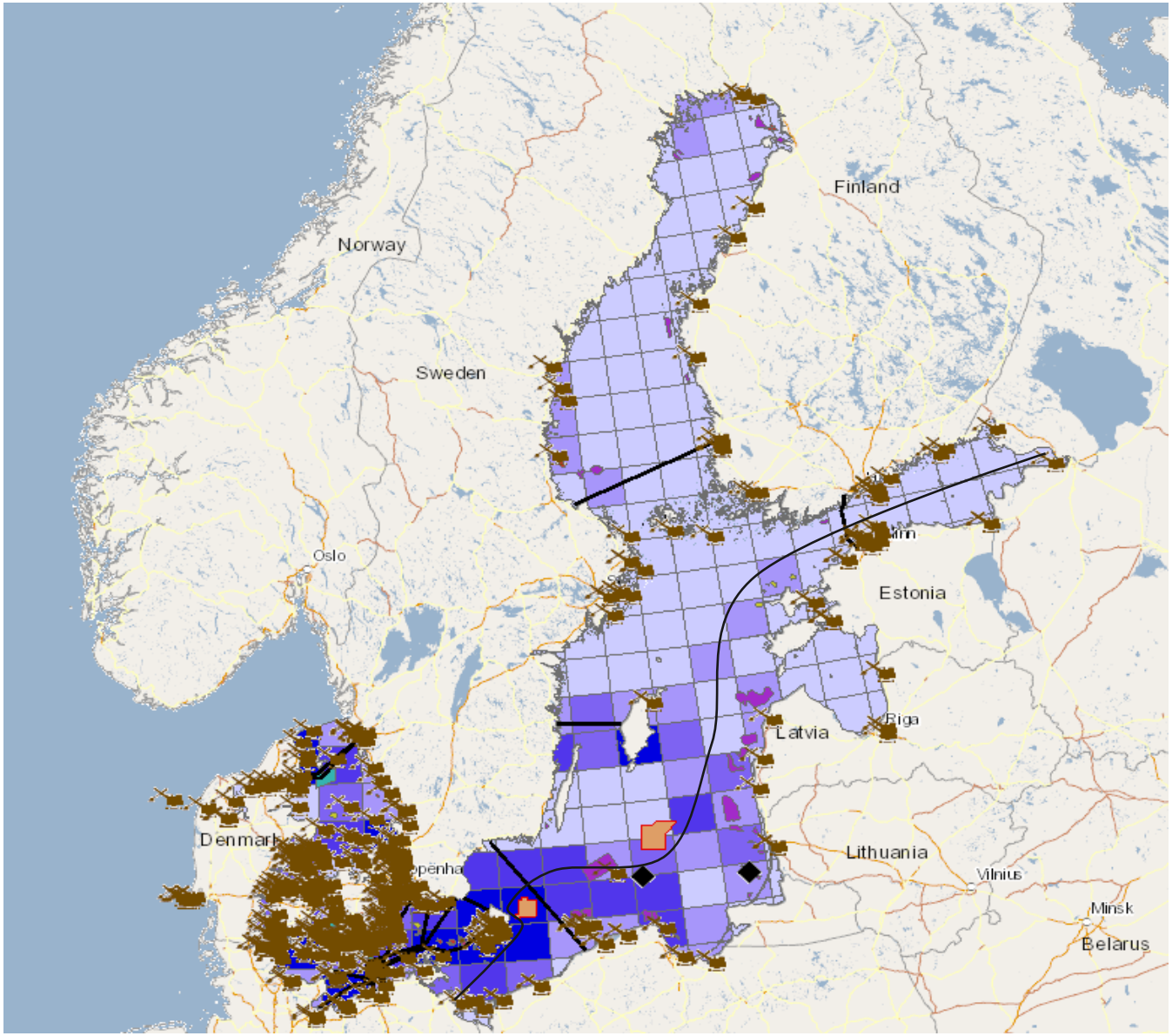

Legend:

- CWA Dumps
- Dredge sites
- Offshore wind farms (planned)
- Bottom Trawling intensity
- Pipelines and Cables

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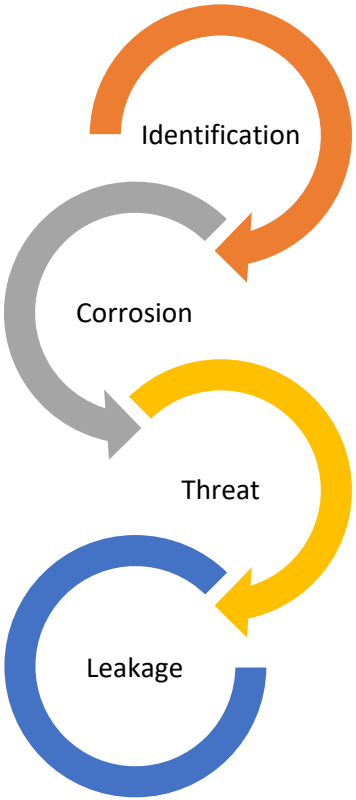
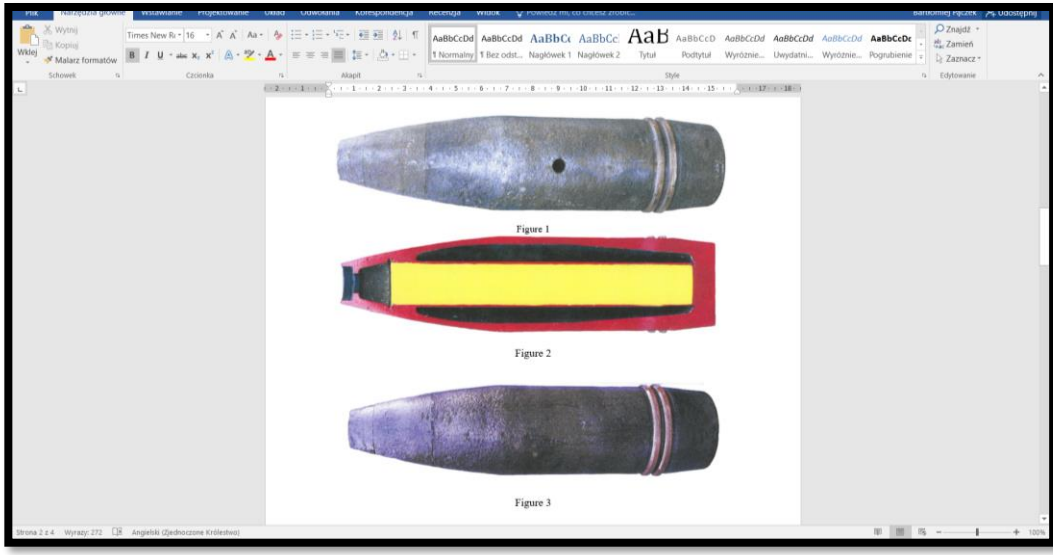
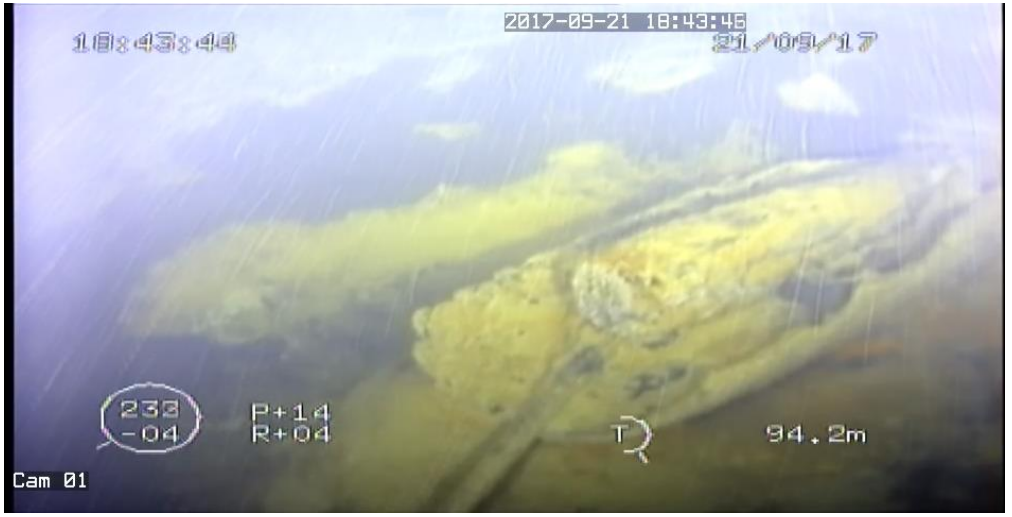
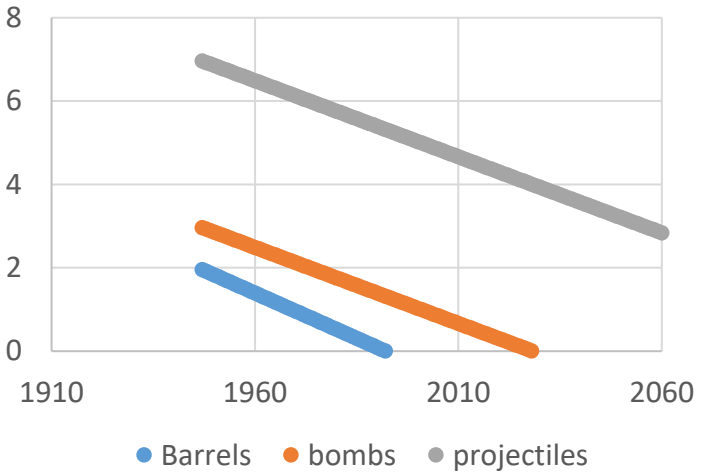
Munition Status





Corrosion





Barrels V_k=0,0434 mm/rok
Bombs V_k=0,0365 mm/rok
In sediments V_k=0,0313 mm/rok

Wall thickness:
Barrels 1.5 do 2 mm
Bombs 3 mm
Projectiles 5-7 mm

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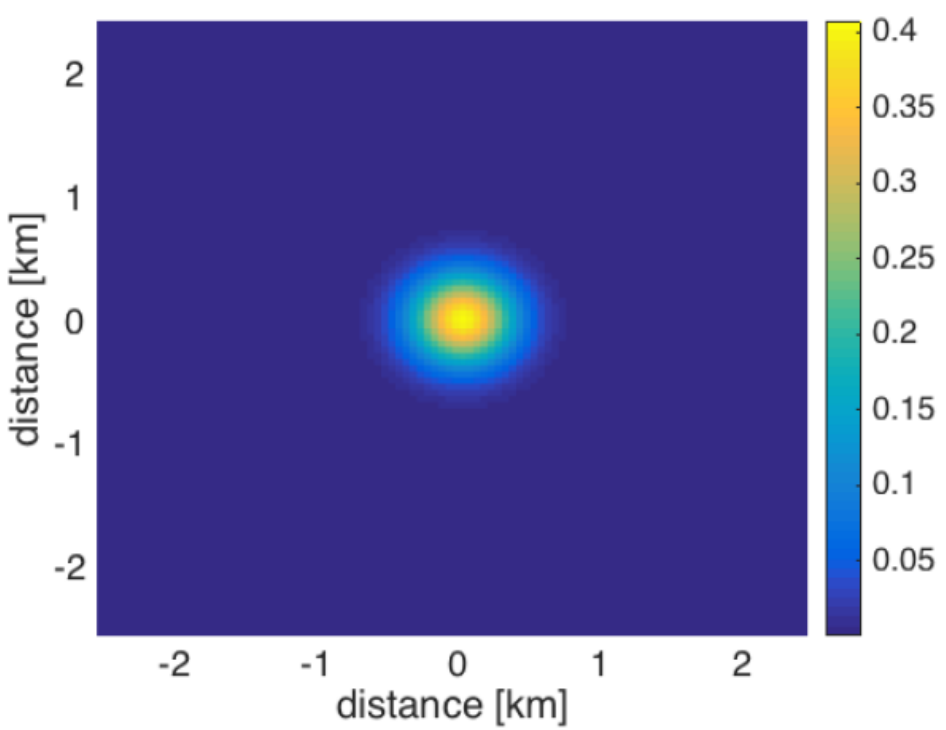
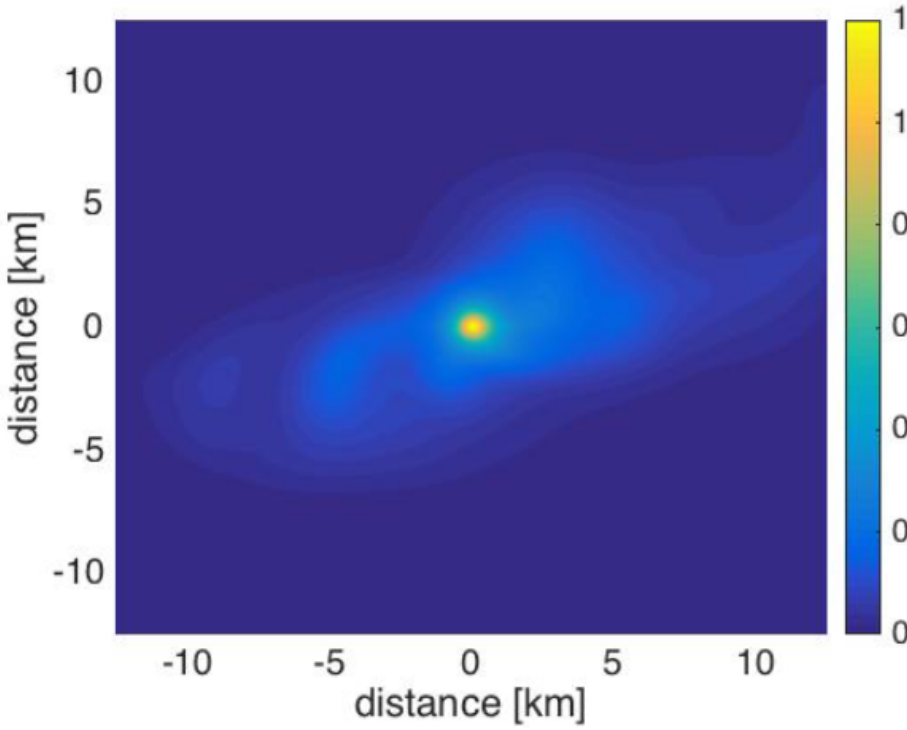
High Resolution Model (HRM)-Bornholm Deep (constant leakage)





Initial state and situation after 5 days of estimated potential le
vertical axes represent distance in relative units. Color scale can
level of contamination.

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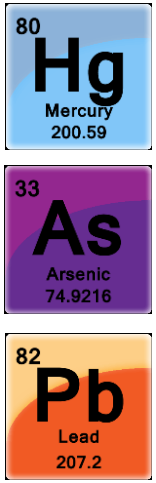
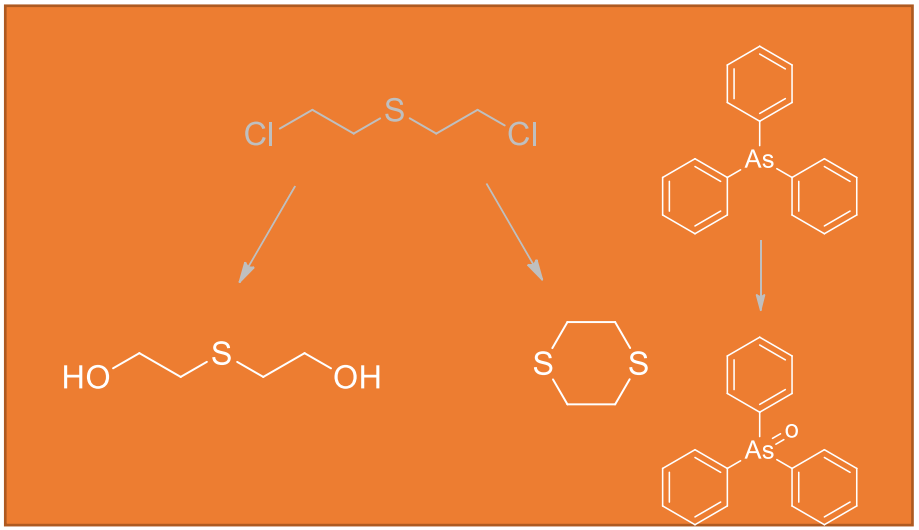
Pollution of sediments and water

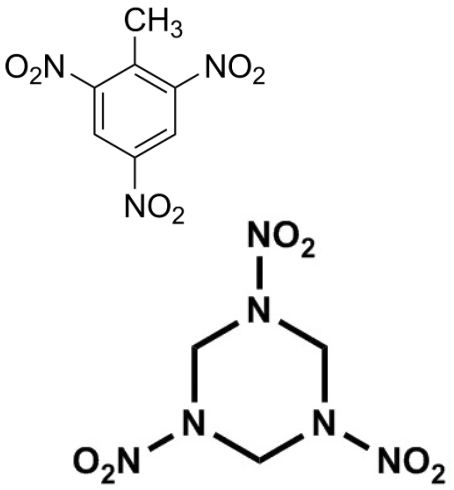
Metals



Chemical Warfare Agents



Explosives



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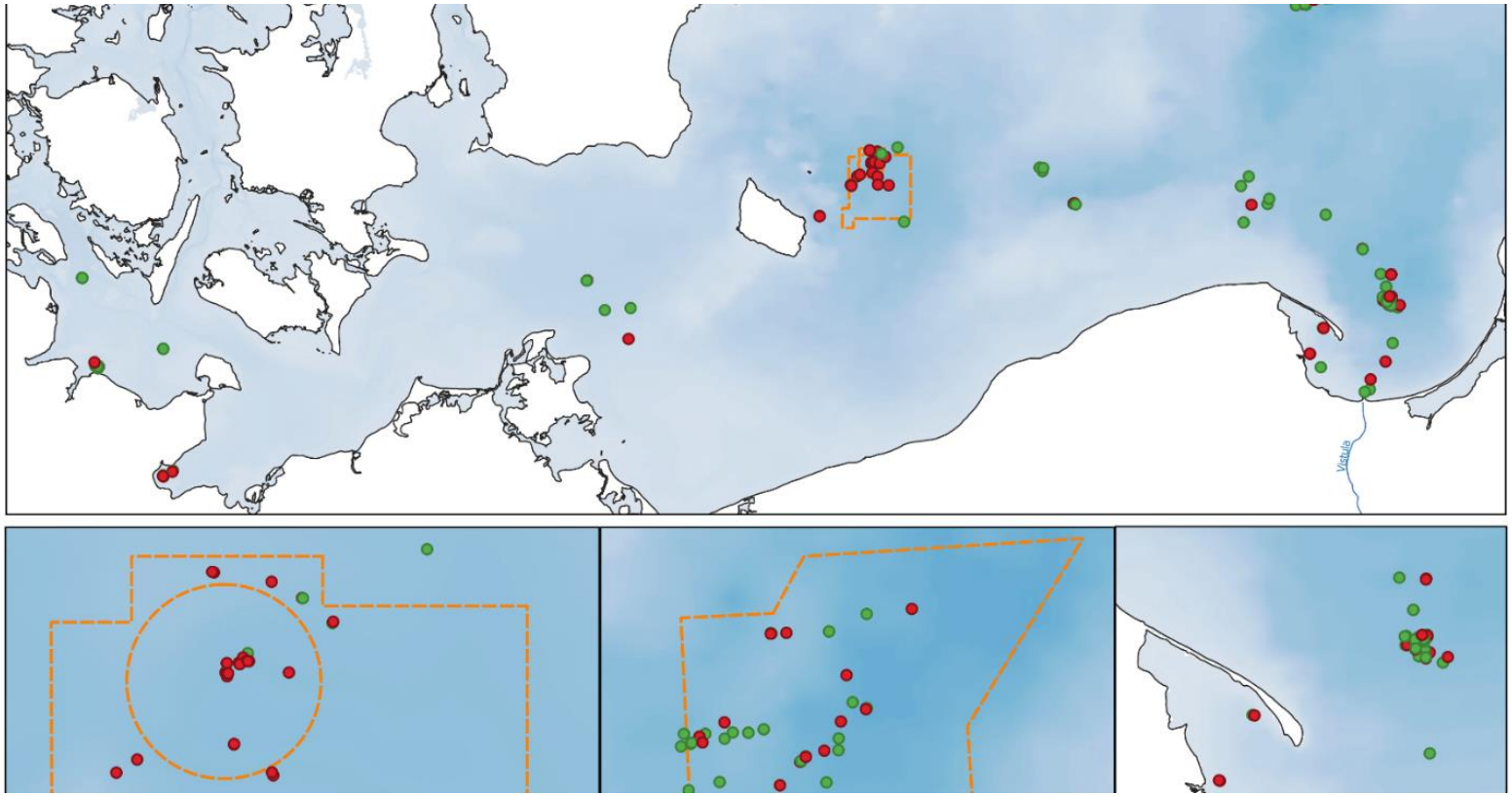
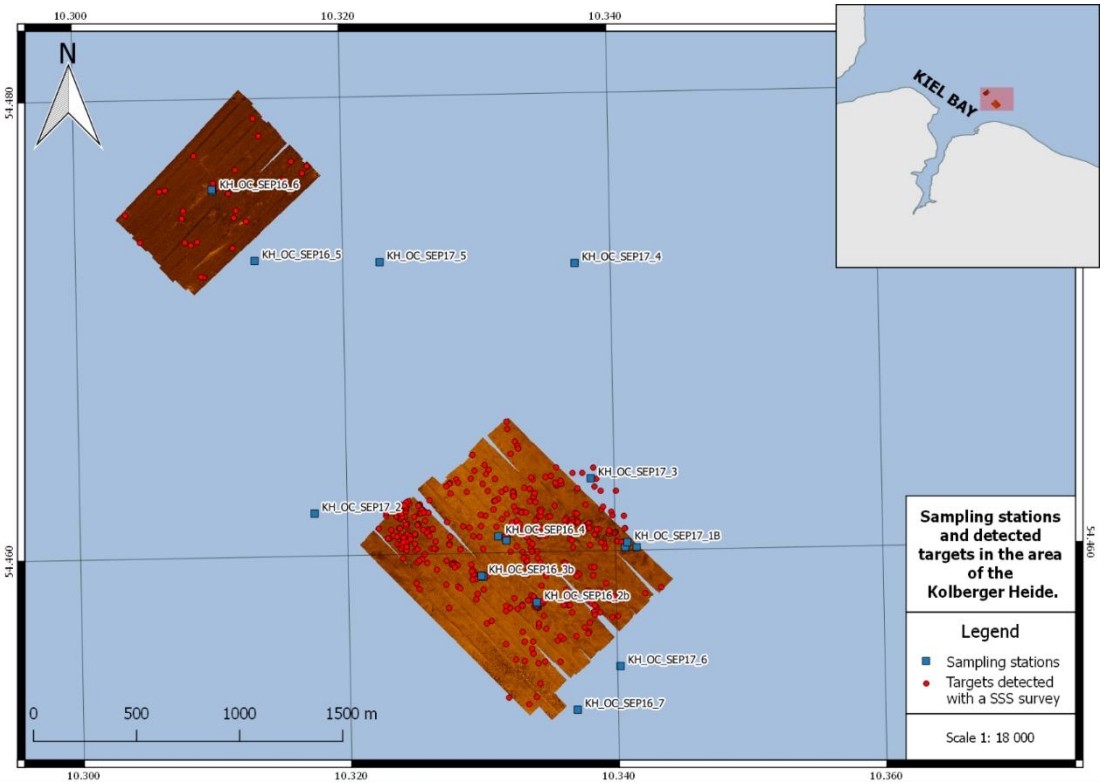
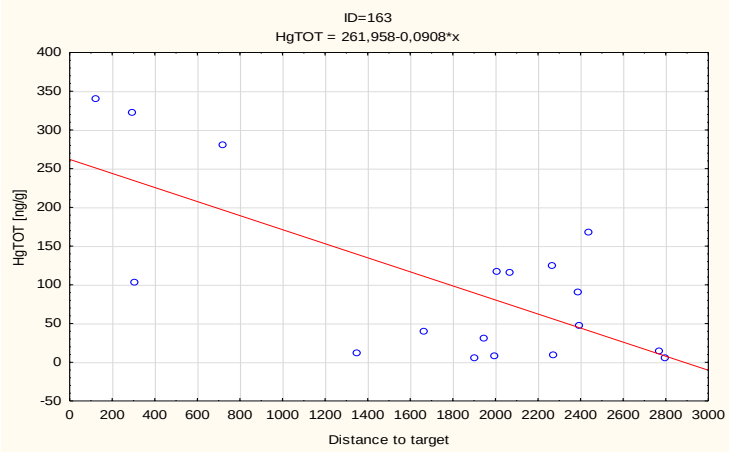
Contamination of sediments



Degradation Products

Overal concentrations





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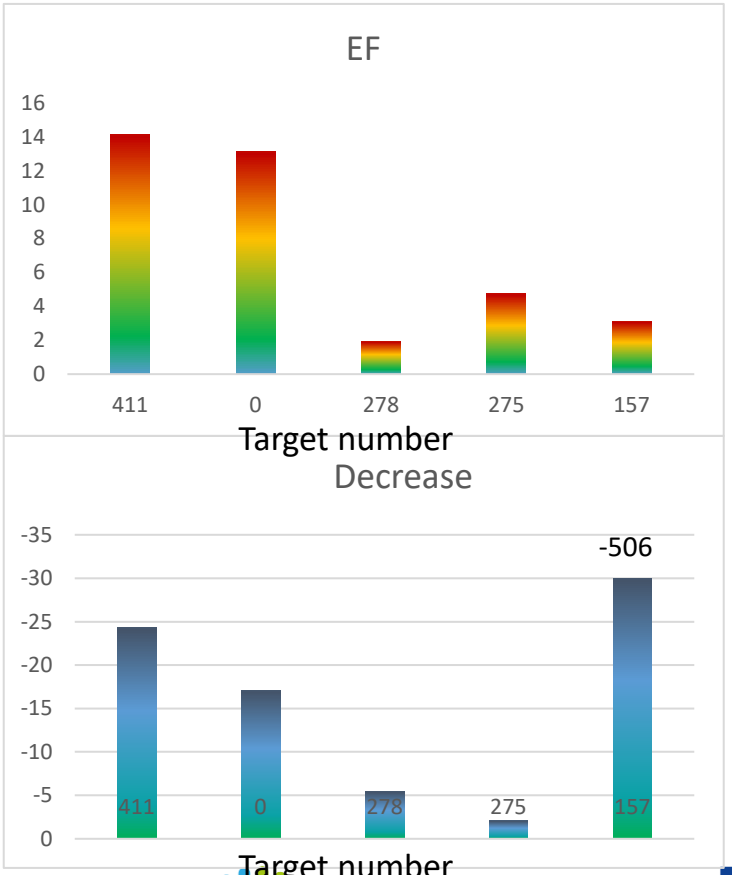
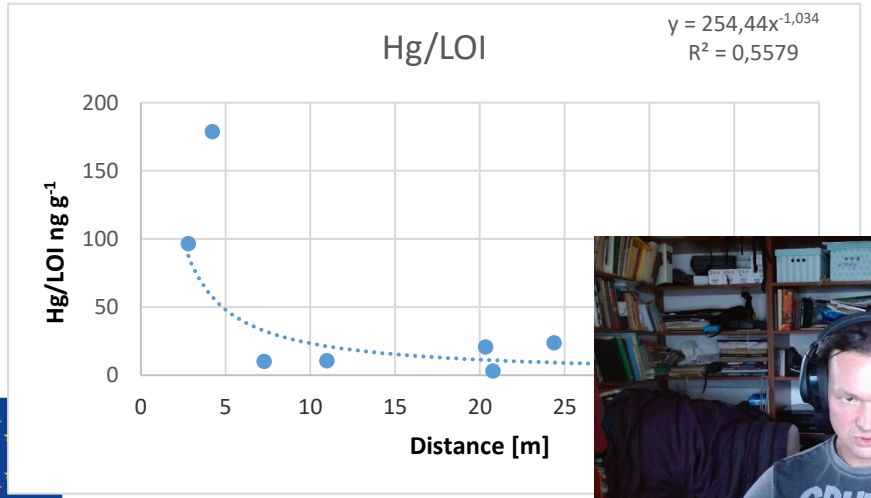
Enrichment, range



- Large sources predominantly local
- Sharp gradients
- May depend on corrosion
- Range not directly depend on concentration



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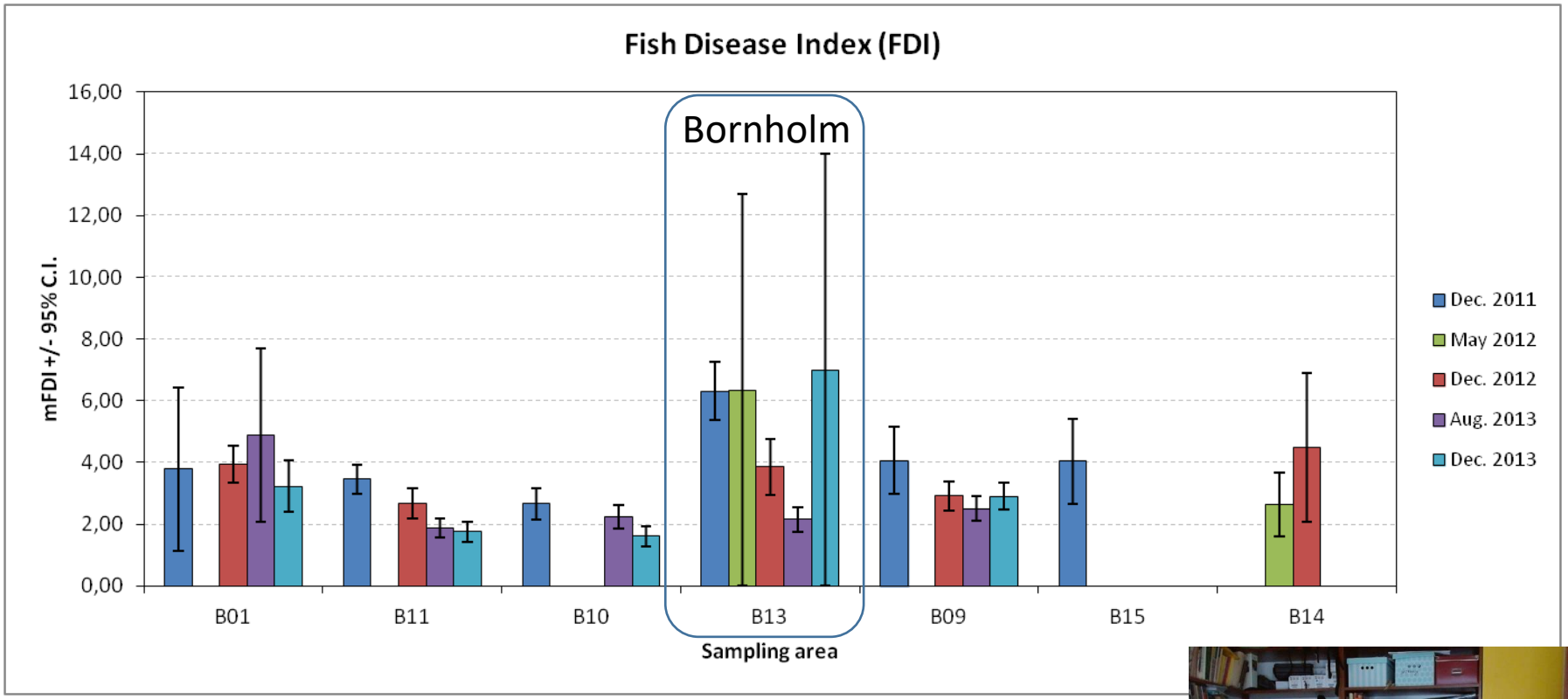
Impact on biota



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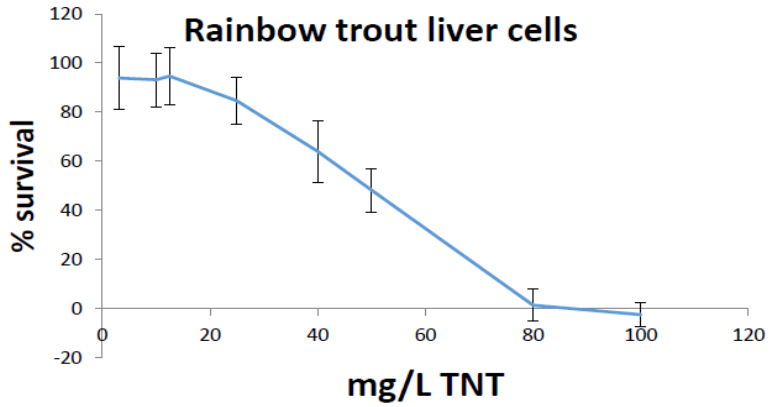
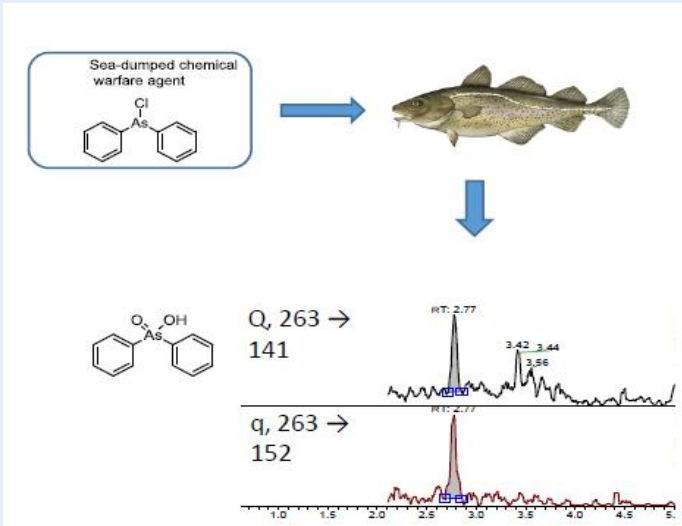
Impact

Toxicity



Bio accumulation



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Fish results

- 3 out 100 reference cod muscle contained TPAox
- No DPA detected from Bornholm reference area
- 13 % of studied cod muscle samples collected from Bornholm dumpsite have contained arsenic CWAs
  - 20 % analysed cod liver samples have contained TPAox

Species	Sampling area	Number of samples	Muscle		Liver	
			DPA	TPAox	DPA	TPAox
Cod	Bornholm reference site B09	100	-	**3/100**	0/10	0/10
Cod	Bornholm dumping site B13	120	**9/120**	**10/120**	0/10	**3/15**
Saithe	Måseskär	9	NA	NA		
Hagfish	Skagerrak (wreck 13)	20	**10/20**	**19/20**		

Food web impact

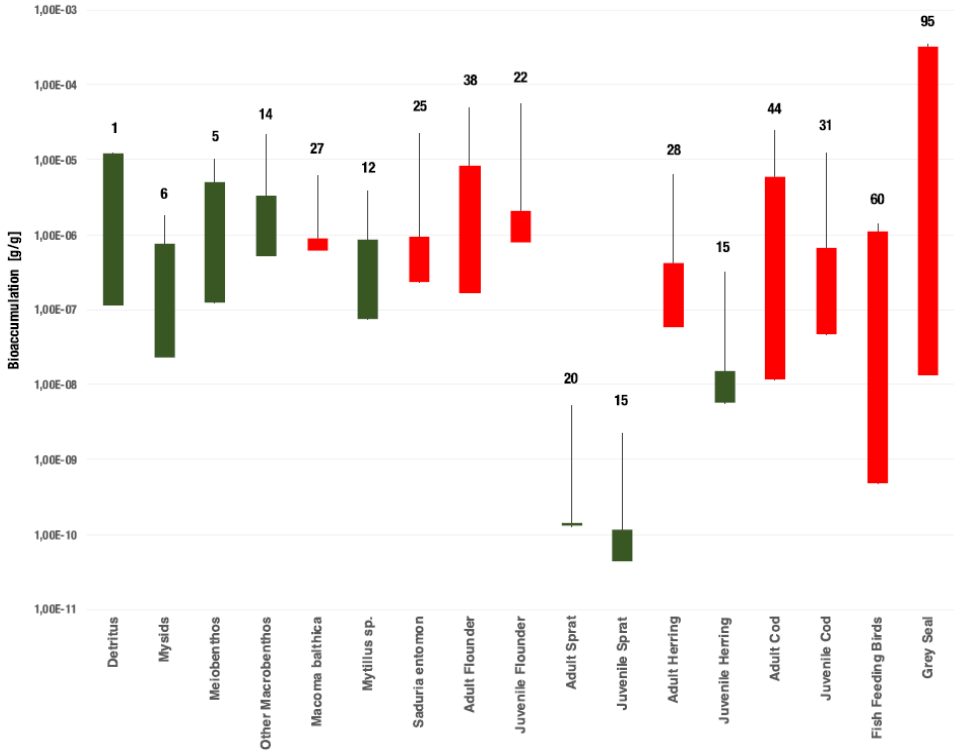

Figure 3.

Modelled t_0, t_{end} and maximum concentrations of Clark I + degradation products in biota and detritus per 1 gram of biomass. Green color represents a decrease and r[illegible] concentration during 10 years from leakage. Numbers above each box represent the months when maximum concentrations occurred.

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ECO Tox Toolbox

Presence	Leakage	Impact
Detection	Sediments	Biodiversity
Identification	Biota	Conditions
	Porewaters	Biomarkers

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DSS

www.daimonproject.com

Objects		
Munition/wrecks		Fish/sediment/mussles
Geo position		
Type of munition State of munition Position on sea floor	**Properties**	Type Weight Length
Corrosion Sediment Pressure Salinity Fishing intensity	**Actors on the object**	Hazard substances Temperature

State of hazardness

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DAIMON

Chem. WF
Munition
New Source
...

Private map

Enter data about a new detection of warfare agents

Chem. WF | Munition

Date of detection: 16 / 11 / 2018

Place of detection: GPS Coordinates

What munition was detected:

- Sea mine
- Land mine

- fired
- lost
- dumped
- unkown

Enter new munition type

How was the munition detected:

- On sea ground
- adrift
- fishernet
- Washed up at the coast
- other

State of corrosion: 4

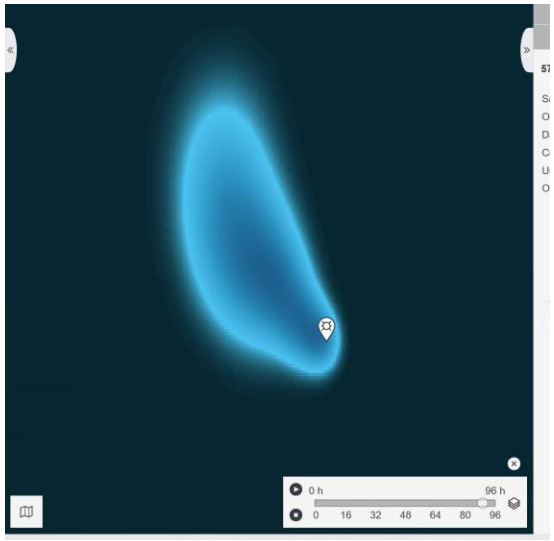
Leaks: 0

Calculated ecological hazardousness: (low)

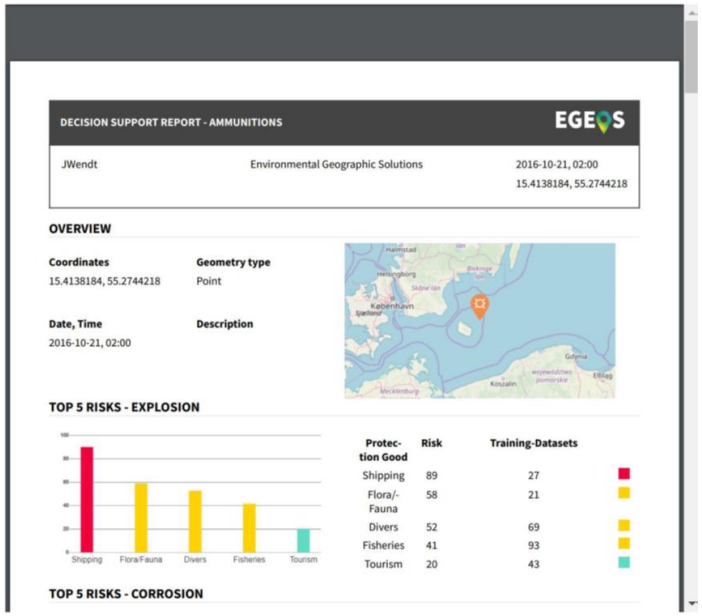
Level of confidence: (low)

Cancel | Save data

Models and reports



DECISION SUPPORT REPORT



DECISION SUPPORT REPORT - AMMUNITIONS

EGEOS

JWendt | Environmental Geographic Solutions | 2016-10-21, 02:00 | 15.4138184, 55.2744218

OVERVIEW

Coordinates
15.4138184, 55.2744218

Geometry type
Point

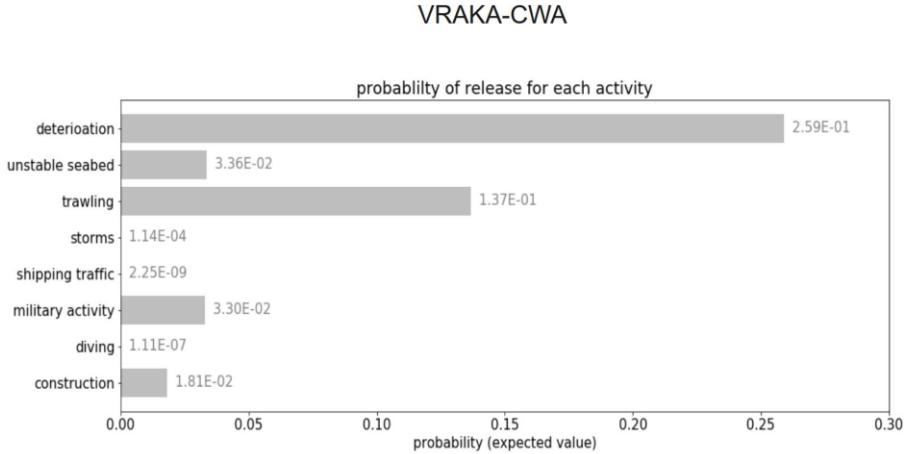
Date, Time
2016-10-21, 02:00

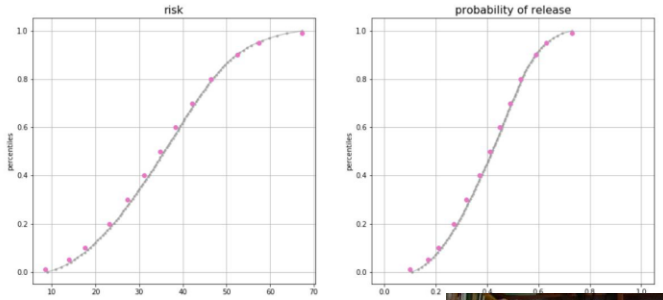
Description

TOP 5 RISKS - EXPLOSION

	Protec-tion Good	Risk	Training-Datasets
Shipping	89	27	
Flora/-Fauna	58	21	
Divers	52	69	
Fisheries	41	93	
Tourism	20	43	

TOP 5 RISKS - CORROSION





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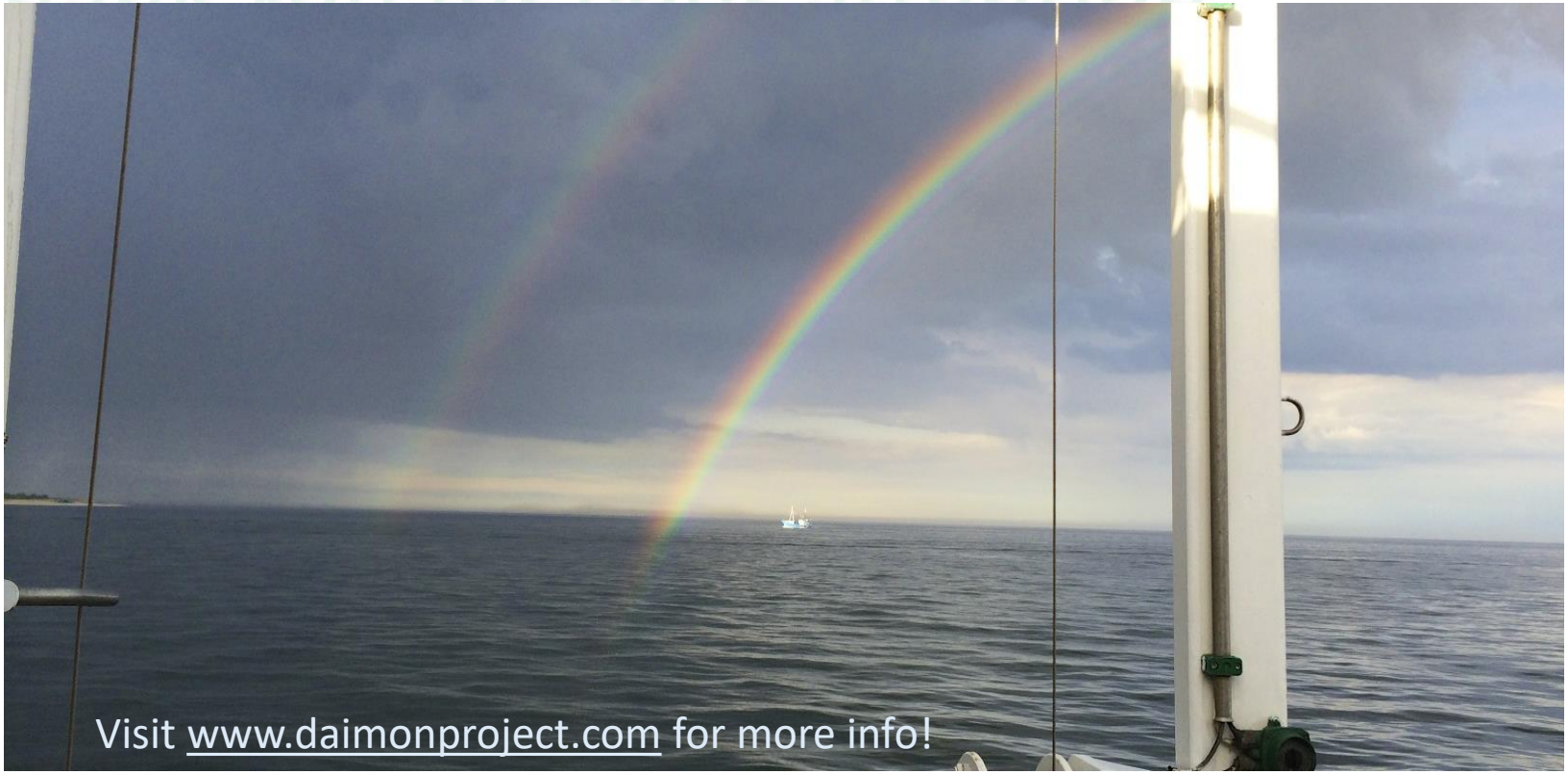
Thank You for your attention



1) 'The research work was fund by the European Union (European Regional Development Fund) under the Interreg Baltic Sea Region Programme 2014-2020, project #R013 DAIMON'

2) 'The research work was financed by the Ministry of Science and Higher Education from the 216-2019 science funding allocated for the implementation of international co-financed project'

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